

ORIGINAL ARTICLE

Taxonomy on crane flies in family Tipulidae and Limoniidae (Diptera: Tipuloidea) from Yaoluoping National Nature Reserve, Anhui, China

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Abstract The paper reports 13 species from Yaoluoping National Nature Reserve, Anhui, China, including a new species and a new subspecies, *Tipula (Emodotipula) alexanderi* Men, **sp. nov.** and *Nephrotoma impigra anqingensis* Men, **subsp. nov.** The female of *Libnotes (Libnotes) pseudonohirai* Men, 2015 is described and illustrated for the first time. The males of *Holorusia henana* Yang, 1999 and *Tipula (Vestiplex) jiangi* Yang & Yang, 1991 are redescribed and illustrated with new morphological characters. A key to all species is provided.

Key words Tipuloidea, Limoniidae, *Emodotipula*, *Nephrotoma*, new species.

1 Introduction

Yaoluoping National Nature Reserve is located in Yuexi County, western Anhui, which covers an area of 123 square kilometers among Dabieshan Mountains. Most of its lands are shaded woodland habitats under north subtropical monsoon climatic. The special geographical situation makes this area an ideal repository of biological resources with rich species and diversified ecosystems.

The fauna of crane flies in Yaoluoping National Nature Reserve was relatively poorly documented in the previous studies. From the year of 2012 to 2016, we investigated crane flies species in this area. In the course of field investigation, 13 species, including a new species and a new subspecies, were found. The new taxa are described and illustrated. The female of *Libnotes (Libnotes) pseudonohirai* Men, 2015 is described and illustrated for the first time. The males of *Holorusia henana* Yang, 1999 and *Tipula (Vestiplex) jiangi* Yang & Yang, 1991 are redescribed and illustrated with new morphological characters. The photographs can facilitate identification of crane flies species for non-taxonomist. A key to all species mentioned in present paper is provided.

2 Materials and methods

The specimens examined in the present study were pinned specimens, which were collected from Yaoluoping National Nature Reserve, Anhui, by sweep net and light trap. The hypopygium of each male was removed and macerated in 10% NaOH for one hour at 50°C water bath, observed in glycerin and illustrated under a SOIF XTZ-E stereomicroscope (SOIF, Shanghai, China), finally preserved in glycerin jelly in 0.20ml centrifuge tubes. Photographs of the body parts of adults were

obtained using SOIF XTZ-E stereomicroscope (SOIF, Shanghai, China). All measurements are given in millimeters (mm), made with the aid of a digital caliper. The terminology and methods of description and illustration followed Alexander & Byers (1981) and Frommer (1963). All specimens are deposited in the animal specimen room, School of Life Sciences, Anqing Normal University, Anhui, China.

3 Results

3.1 Family Limoniidae

Sixty-six genera in family Limoniidae are known in China (Oosterbroek, 2016). In the course of field investigation, two genera were found in Yaoluoping National Nature Reserve.

Hexatoma (Eriocera) cleopatroides Men, 2015

Hexatoma (Eriocera) cleopatroides Men & Yu, 2015: 157.

Material examined. 1♂ (holotype). Anhui, Yaoluoping National Nature Reserve, Meili Village (30°58'N, 116°03'E), 16 August 2013, coll. Zhengkui Liu. 1♂1♀ (paratypes), Anhui, Yaoluoping National Nature Reserve, Meili Village (30°58'N, 116°03'E), 17 August 2013, coll. Qiulei Men.

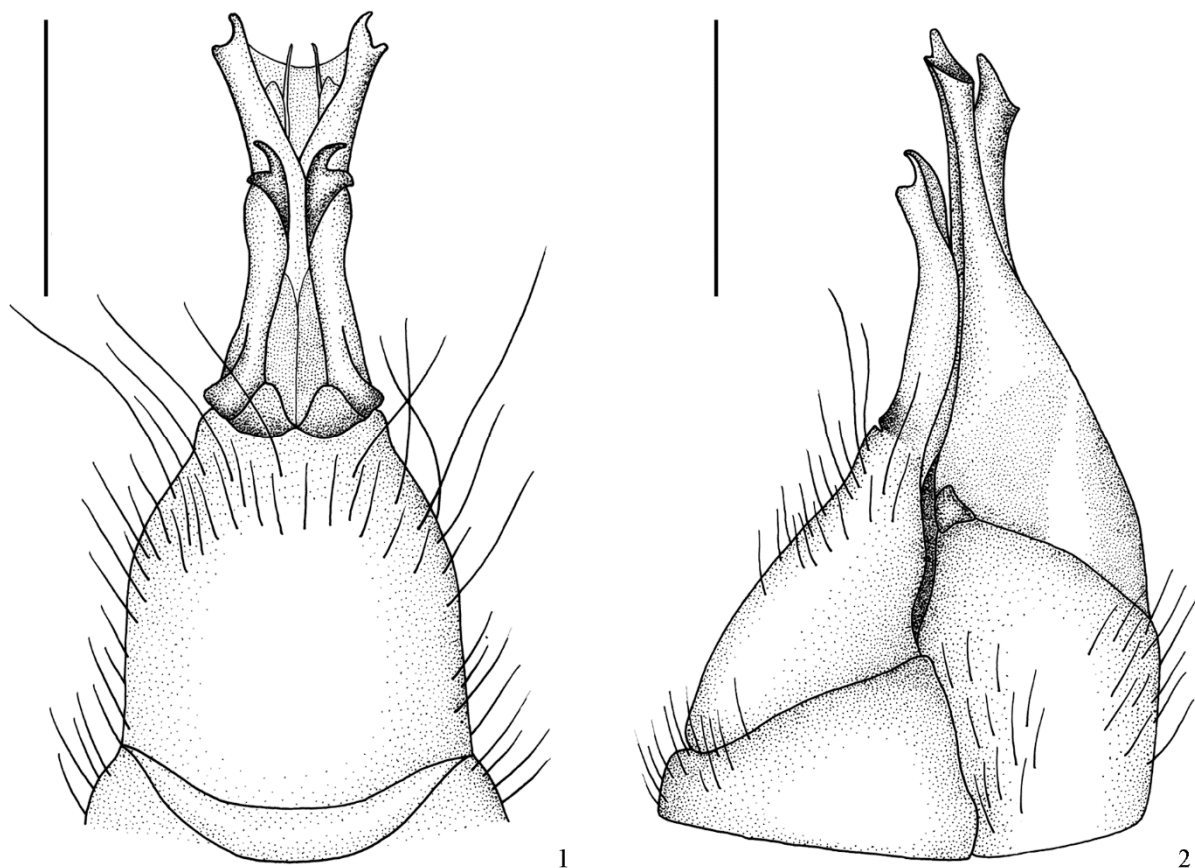
Distribution. China (Anhui).

Libnotes (Libnotes) pseudonohirai Men, 2015 (Figs 1–2)

Libnotes (Libnotes) pseudonohirai Men, 2015a: 82.

Description. Female body length 12.1–12.3 mm, wing 16.8–17.0 mm, antenna 4.0–4.2 mm.

Colors of head, thorax and abdomen similar to those of male.



Figures 1–2. *Libnotes (Libnotes) pseudonohirai*. 1. Ovipositor, dorsal view. 2. Ovipositor, lateral view. Scale bars = 1.0 mm.

Ovipositor festucine-yellow, cerci furcated apically, as long as tergite ten, darker in coloration at base (Figs 1–2). Hypoalva widened basally, gradually narrowed to apex, posterior margin concaved shallowly in dorsal view, beyond the end of cerci, distal end slightly enlarged (Figs 1–2).

Material examined. 1♂ (holotype), Anhui, Yaoluoping National Nature Reserve, 14 August 2013, coll. Qiulei Men. 2♂ (paratypes), Anhui, Yaoluoping National Nature Reserve, 17 August 2013, coll. Zhengkui Liu. 9♀6♂, Yaoluoping National Nature Reserve, Duoziqian (30°58'N, 116°06'E), 24 August 2016, coll. Qiulei Men, Zhiyong Lu. 11♀9♂, Yaoluoping National Nature Reserve, Jingangling (30°58'N, 116°06'E), 25 August 2016, coll. Qiulei Men.

Distribution. China (Anhui).

***Libnotes (Libnotes) wanensis* Men, 2015**

Libnotes (Libnotes) wanensis Men, 2015a: 82.

Material examined. 1♂ (holotype), Anhui, Yaoluoping National Nature Reserve, 14 August 2013, coll. Qiulei Men. 1♂ (paratype), 16 August 2013, same data as holotype.

Distribution. China (Anhui).

3.2 Family Tipulidae

Seventeen genera in family Tipulidae are reported in China (Oosterbroek, 2016). In the course of field investigation, four genera were found in Yaoluoping National Nature Reserve.

***Dictenidia yuexiensis* Men, 2014**

Dictenidia yuexiensis Men, 2014: 187.

Material examined. 1♂ (holotype), Anhui, Yaoluoping National Nature Reserve, Jingangling (31°00'N, 116°07'E), 14 August 2013, coll. Zhengkui Liu. 1♂ (paratype), Anhui, Yaoluoping National Nature Reserve, Baojiexiang (31°03'N, 116°06'E), 14 August 2013, coll. Qiulei Men.

Distribution. China (Anhui).

***Holorusia henana* Yang, 1999 (Figs 3–15)**

Holorusia henana Yang, 1999: 37.

Diagnosis. *Holorusia henana* can be recognized by prescutum with three black stripes, the median one with a black mid-line, by the yellow pleura lacking of dorsal-longitudinal stripe. Wings are yellowish-brown with cells c, sc and stigma darker than the ground color. Abdomen is generally yellowish-brown, tergites one to seven of which have lateral stripes and very narrow posterior stripes. Tergite nine has a V-shaped notch medially.

Redescription. Male body length 35.0 mm, wing 42.0 mm, antenna 4.7 mm.

Head. Rostrum yellowish-brown, darker at ventral side. Nasus distinct, black apically, densely covered with brown setae. Antennae yellowish-brown, scape elongated, cylindrical, pedicel very short, flagellum 10-segmented, each flagellomere gradually smaller and shorter. Palpi black. Head yellowish-brown, occiput with indistinct mark (Fig. 3).

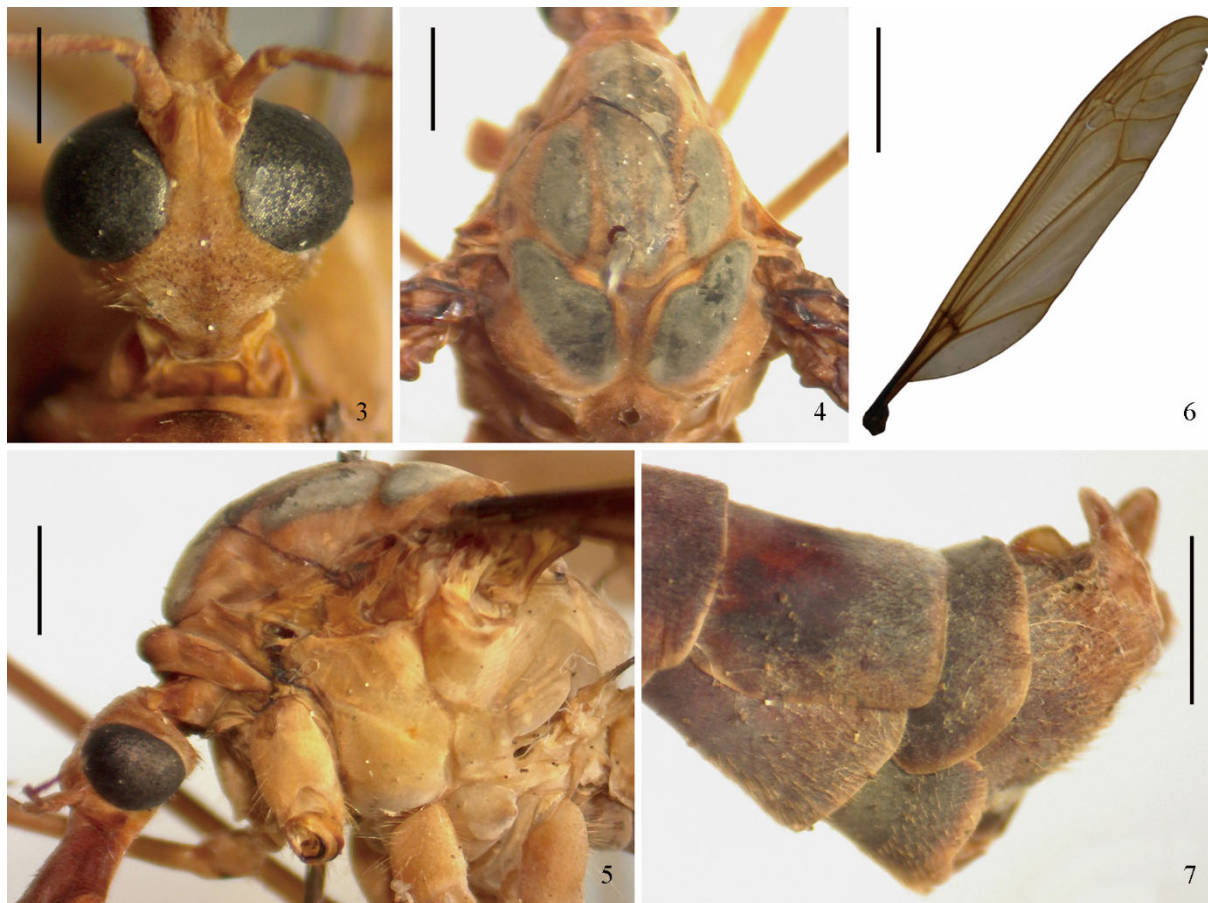
Thorax. Pronotum yellowish-brown, darker medially. Prescutum yellowish-brown with three black stripes (grayish-green in fresh); the median stripe with basal half gradually narrowed to base, parallel at apical half, with a dark median line; the lateral stripe oval, nearly half of length of median stripe (Fig. 4). Scutum yellowish-brown, each lobe with a black stripe, median area of scutum brown (Fig. 4). Scutellum yellowish-brown (Fig. 4). Postnotum yellow, heavily whitish pruinose (Fig. 4). Pleura yellow, without dorsal-longitudinal stripe (Fig. 5). Halteres with stem yellowish-brown, knob darker. Legs with coxae yellow, trochanters, femora and tibiae yellowish-brown, the femora with brown tips; tarsi dark brown. Wing yellowish-brown, cells c and sc and stigma darker than the ground color, veins brown. Rs very short, as long as R_{1+2+3} , cell m_1 short-petiolate, discal cell narrow, slightly shorter than cell m_1 (Fig. 6).

Abdomen generally yellowish-brown, tergites one to seven with lateral stripes and very narrow posterior stripes, tergites eight and hypopygium wholly brown. Sternites with narrow stripes on posterior margins. Hypopygium compressed and broadened (Figs 7–8). Tergite nine densely covered with short setae, medially with a V-shaped notch (Fig. 9). Sternite eight with posterior margin straight, without mid-posterior incision (Fig. 10). Outer gonostylus flaky, widened basally and gradually narrowed to apex, rounded apically (Figs 8–10). Inner gonostylus curved and narrow, basally with a strongly sclerotized prominence bearing long hairs, apically enlarged with an incision on dorsal margin (Figs 11–13).

Semen pump with compressor apodeme fan-shaped, shallowly emarginated at dorsal margin (Figs 14–15). Posterior immovable apodeme with two arms curved dorsally in lateral view, distinctly shorter than compressor apodeme, gradually narrowed to apex (Fig. 14). Anterior immovable apodeme shorter than compressor apodeme, gradually narrowed to apex in lateral view, acute apically (Fig. 14). Aedeagus elongated, tubular, two times longer than semen pump (Fig. 14).

Material examined. 1♂, Anhui, Yaoluoping National Nature Reserve, Yaoluoping Village (30°59'N, 116°04'E), 15 August 2012, coll. Dan Mu.

Distribution. China (Anhui, Henan).



Figures 3–7. *Holorusia henana*. 3. Head, dorsal view. 4. Thorax, dorsal view. 5. Thorax, lateral view. 6. Wing. 7. Hypopygium, lateral view. Scale bars: 3, 6 = 1.0 mm; 4–5, 7 = 2.0 mm.

***Holorusia herculeana* (Alexander, 1941)**

Ctenacroscelis herculeana Alexander, 1941: 383. Synonymised by Vane-Wright, 1967: 536.

Material examined. 1♂, Anhui, Yaoluoping National Nature Reserve, Yaoluoping Village (30°59'N, 116°04'E), 22 August 2016, coll. Qiulei Men.

Distribution. China (Anhui, Sichuan, Fujian, Guizhou, Hunan).

***Nephrotoma impigra anqingensis* Men, subsp. nov. (Figs 16–30)**

Diagnosis. The new subspecies has brown occipital mark. Prescutum is yellow with three black stripes. Wings are transparent, yellowish-gray with stigma light brown. Abdominal tergites are yellow, have brown stripes, tergites six and seven of which are almost wholly covered with brown spot. Tergite nine is produced into a slender, straight, nail-like projection on lateral angle, the posterior margin of which is densely covered with black points.

Description. Male body length 9.1–9.5 mm, wing 9.7–8.0 mm, antenna 4.0–4.2 mm.

Head. Rostrum yellow with nasus black. Nasus densely covered with black long hairs. Antennae with scape elongated,

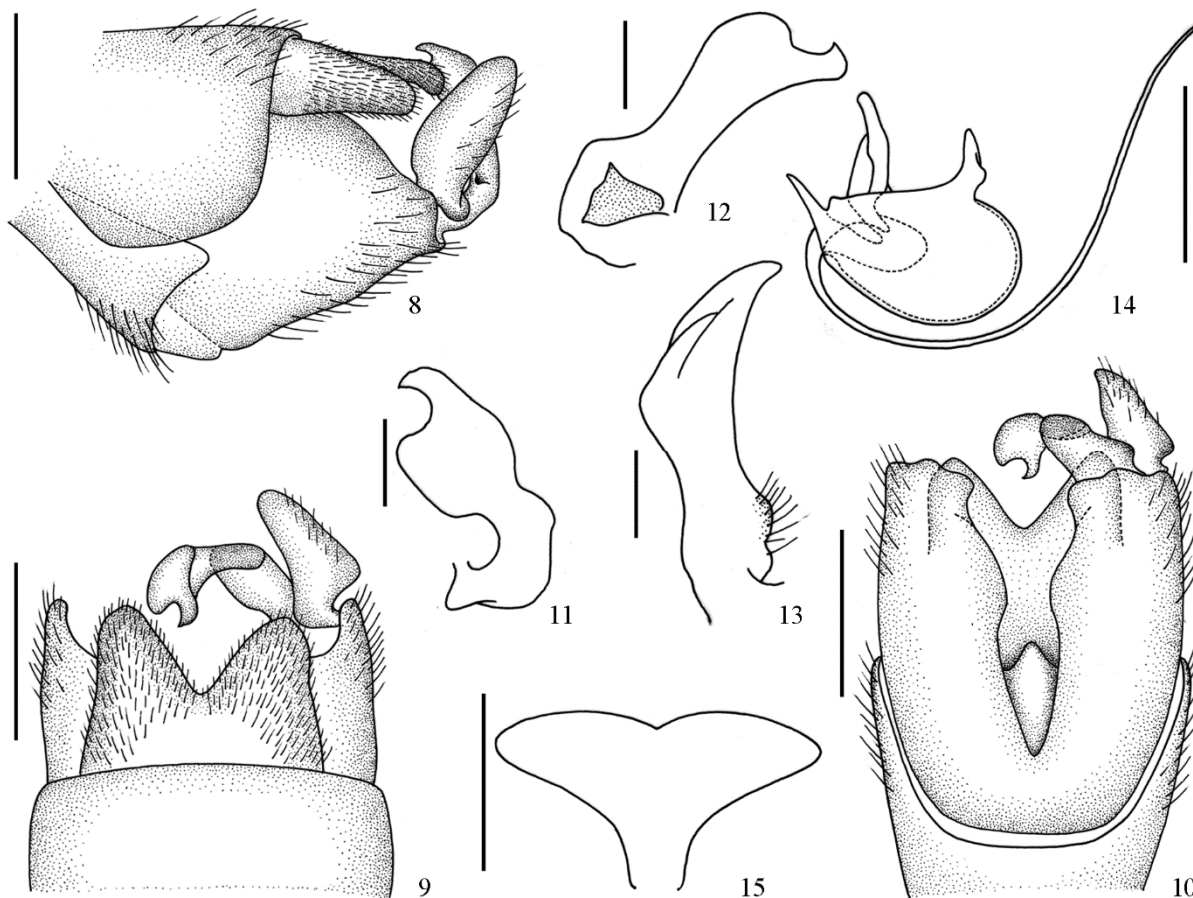
yellowish-brown, expanded apically; pedicel very short, pot-shaped, light brown; flagellum black, each flagellomere enlarged at base, with black verticils distinctly shorter than the flagellomeres from which they arise. Palpi brownish-black, the outer two segments somewhat paler. Head yellow, occipital mark brown, widened basally and acute apically, the point extending to the base of vertical tubercle (Fig. 16).

Thorax. Pronotum yellow medially, black laterally, and then changing to brown basally (Figs 17–18). Prescutum yellow with three black stripes, the median one broadened apically and gradually narrowed to base (Fig. 18). Scutum yellow, lobes variegated by black stripes (Fig. 17). Scutellum yellow, almost wholly covered with a black spot (Fig. 17). Postnotum yellow with a brown median area (Fig. 17). Pleura yellow, with yellowish-brown areas on anepisternum, caudal margins of anepisternum, katepisternum and ventral meron (Fig. 18). Halteres with stem yellowish-brown, knob dark brown. Legs with coxae and trochanters yellowish-brown; femora dark brown except the restricted paler base; tibiae and tarsi dark brown. Wing transparent, yellowish-gray; stigma oval, light brown; Rs very short, subequal to basal part of R_{4+5} , cell r_1 without stigmal trichia, cell m_1 short-petiolate (Fig. 19).

Abdominal tergites yellow, with brown stripes medially, tergites six and seven almost wholly covered with brown spot, lateral stripe lacking (Fig. 20). Sternites one to seven yellow, sternite eight brown. Hypopygium yellowish-brown. Ninth tergite produced into a slender, straight, nail-like projection on lateral angle, each with a series of four black points (Figs 23–25). Posterior margin of ninth tergite with an incision medially, densely covered with small black points (Figs 24–25). Outer gonostylus spindle-shaped (Figs 23–24, 28). Inner gonostylus with two black beaks (Figs 23–24, 26–28). Sternite eight with posterior margin transverse, unarmed (Fig. 26).

Semen pump with compressor apodeme V-shaped, each arm expended apically (Fig. 30). Posterior immovable apodeme narrow, shorter than compressor apodeme (Fig. 29). Anterior immovable apodeme with arms acute apically, shorter than compressor apodeme (Fig. 29). Aedeagus relatively thick, tubular, at least 3.5 times longer than semen pump (Fig. 29).

Female body length 10.2–10.5 mm, wing 10.5–10.8 mm, antenna 4.0–4.2 mm.



Figures 8–15. *Holorusia henana*. 8. Hypopygium, lateral view. 9. Hypopygium, dorsal view. 10. Hypopygium, ventral view. 11. Inner gonostylus, inner lateral view. 12. Inner gonostylus, outer lateral view. 13. Inner gonostylus, dorsal view. 14. Semen pump, lateral view. 15. Compressor apodeme, dorsal view. Scale bars: 8–10=2.0 mm; 11–14=0.5 mm; 15=0.25 mm.



Figures 16–22. *Nephrotoma impigra anqingensis* Men, **subsp. nov.** 16. Head, dorsal view. 17. Thorax, dorsal view. 18. Thorax, lateral view. 19. Wing. 20. Abdomen (male), lateral view. 21. Ovipositor, lateral view. 22. Ovipositor, dorsal view. Scale bars: 16=0.5 mm; 17–22=1.0 mm.

Colors of head, thorax and abdomen similar to those of male.

Ovipositor yellow. Sternite ten slightly shorter than cerci, parallel in lateral margins in dorsal view (Figs 21–22). Cerci long, acinacifoliate, surpassing the end of hypovalva (Figs 21–22). Hypovalva simple, extending to nearly three quarters length of cerci (Figs 21–22).

Material examined. Holotype. ♂. China, Anhui, Yaoluoping National Nature Reserve, Yaoluoping Village (30°59'N, 116°04'E), 26 August 2016, coll. Qiulei Men, Zhizhong Wang. Paratypes. 18♀25♂, Anhui, Yaoluoping National Nature Reserve, Yaoluoping Village (30°59'N, 116°04'E), 26 August 2016, coll. Qiulei Men. 2♀3♂, Anhui, Yaoluoping National Nature Reserve, DuoZhijian (30°58'N, 116°06'E), 24 August 2016, coll. Qiulei Men.

Distribution. China (Anhui).

Etymology. The specific epithet is a noun ‘*anqing*’ with Latin suffix ‘*ensis*’, referring to the type locality of the new subspecies.

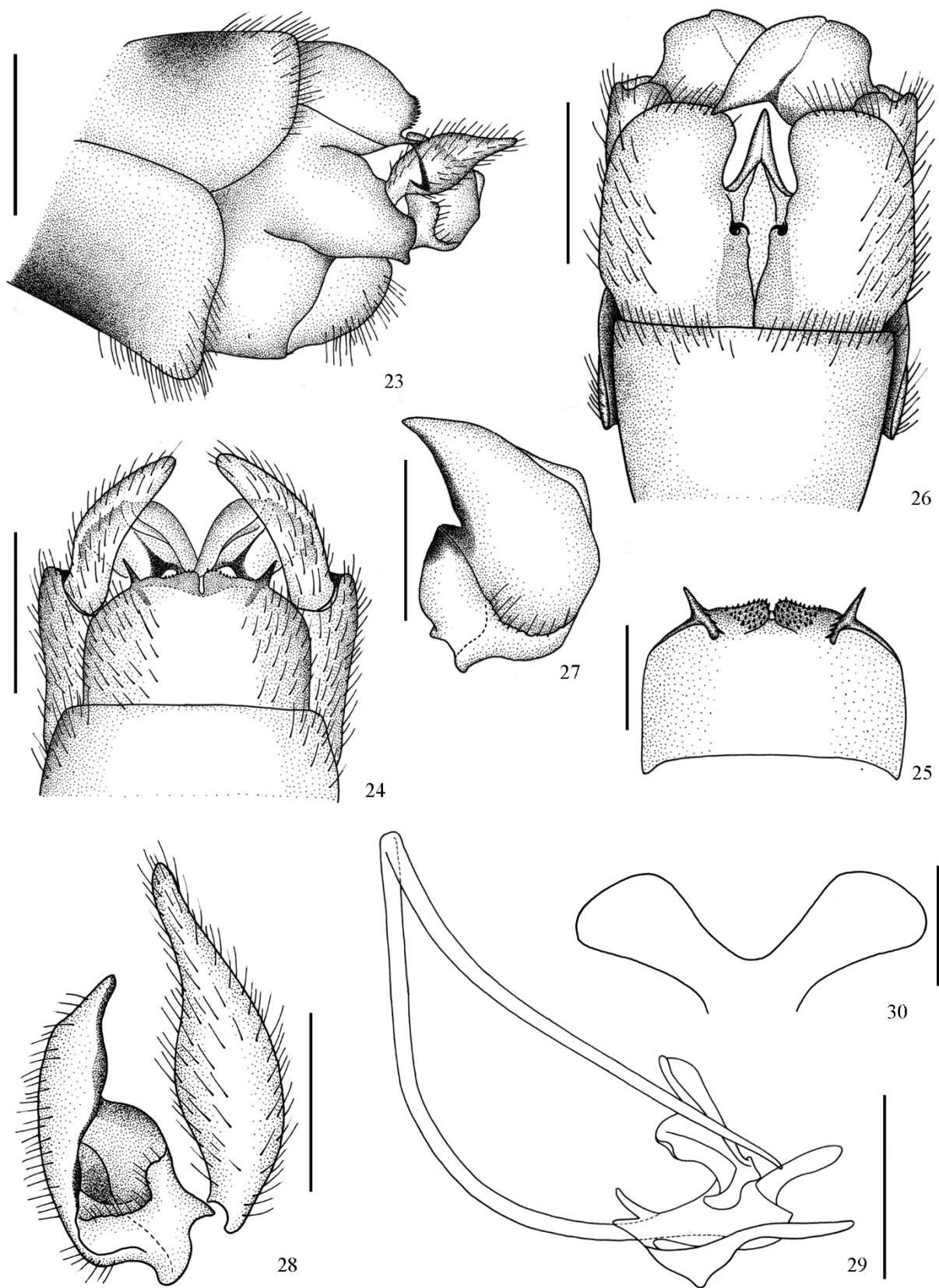
Remarks. The new subspecies differs from the nominal form by venation with cell m_1 short-petiolate (long in nominal subspecies as described by Alexander, 1935b: 138), differs from another subspecies, *Nephrotoma impigra fulvovittata* (Savchenko, 1964) by smaller size, black stripes on prescutum and dark brown femora (stripes on prescutum reddish brown, femora reddish in *N. i. fulvovittata* as described in Savchenko, 1964: 892).

***Tipula (Emodotipula) alexanderi* Men, sp. nov.** (Figs 31–47)

Diagnosis. Body is generally brown in coloration. Head has a narrowed brown occipital stripe. Prescutum is brown with four black stripes, all stripes with darker margins. Wings have grayish-white ground color with cells c and sc slightly brown. Stigma is dark brown. Abdominal tergites are brown, narrowly variegated by black stripes on lateral margins. Tergite nine has a U-shaped notch medially, sternite nine is produced into finger-like processes in lateral angles.

Description. Male body length 12.0 mm, wing 18.4 mm, antenna 3.5 mm.

Head. Rostrum brown with nasus dark brown. Antennae with scape elongated, yellowish, expanded apically; pedicel very short, pot-shaped, light brown; flagellum brown, each flagellomere subequal in length. Palpi with first segment



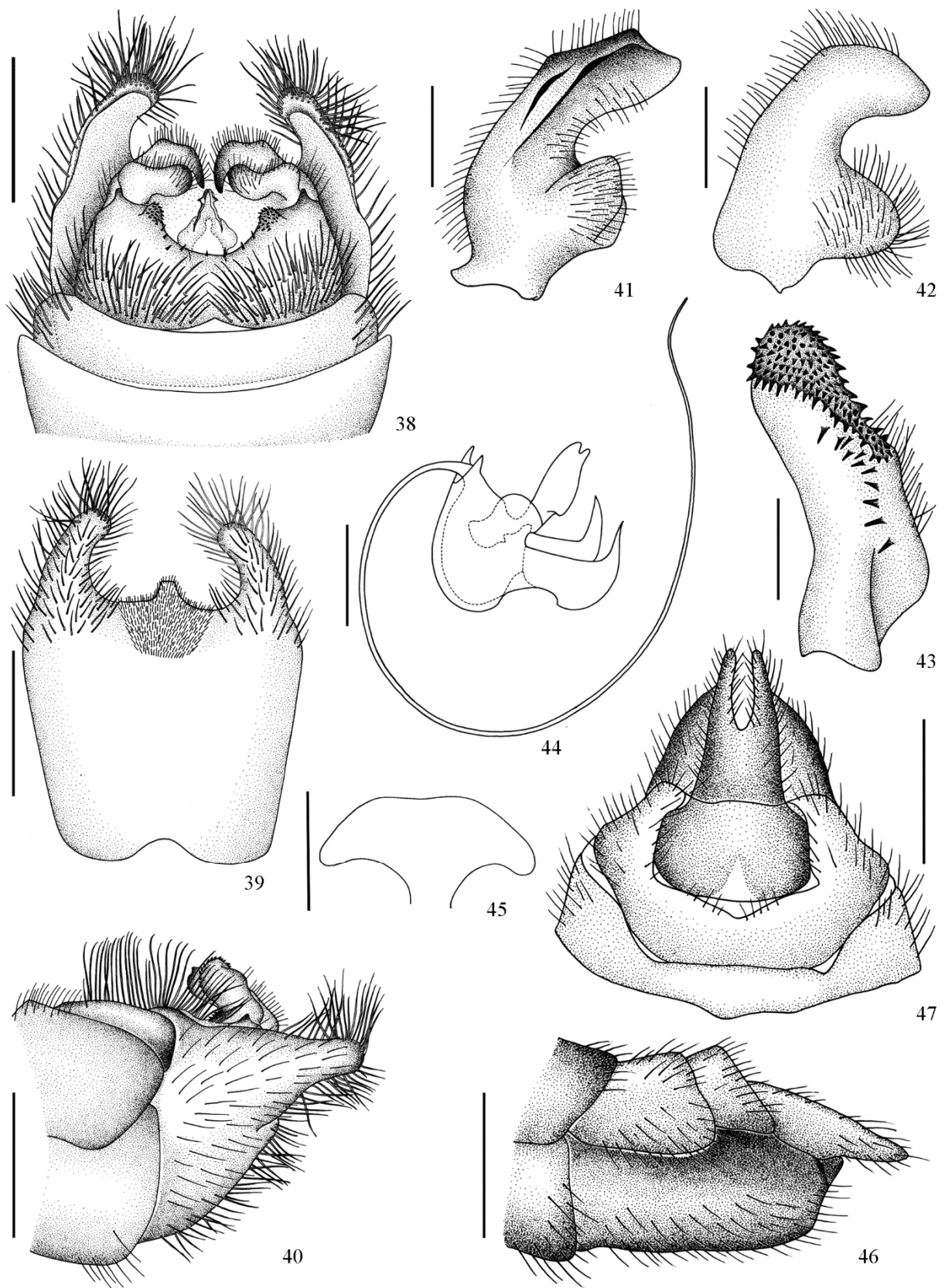
Figures 23–30. *Nephrotoma impigra anqingensis* Men, **subsp. nov.** 23. Hypopygium, lateral view. 24. Hypopygium, dorsal view. 25. Tergite nine, ventral view. 26. Hypopygium, ventral view. 27. Inner gonostylus, outer lateral view. 28. Inner gonostylus and outer gonostylus, dorsal view. 29. Semen pump, lateral view. 30. Compressor apodeme, dorsal view. Scale bars: 23–24, 26=0.5 mm; 25, 27–29=0.25 mm; 30=0.1 mm.

brownish-black, the outer three segments somewhat paler. Head yellowish-brown, occipital mark brown, narrow, surrounded by paler halo (Fig. 31).

Thorax. Pronotum brown, darker medially (Fig. 32). Prescutum brown with four black stripes, all stripes with darker margins (Fig. 32). The median two slightly concaved inward near apex (Fig. 32). Scutum brown, lobes with two subtriangular black spots which connected to each other (Fig. 32). Scutellum brown, median area paler (Fig. 32). Postnotum brown with a black median stripe (Fig. 32). Pleura yellowish-brown, with ventral margin of anepisternum and katepisternum darker (Fig. 33). Halteres with stem yellowish-brown, knob dark brown. Legs with coxae and trochanters yellowish-brown; femora brown with dark brown apex; tibiae and tarsi dark brown. Wing with ground color grayish-white, cells c and sc slightly brown, stigma dark brown, gray areas dispersedly on base of R_s , distal end of R_{1+2} , distal margins of cells r and m and along R_{4+5} and r-m (Fig. 34). Venation R_s elongated, distinctly shorter than R_3 , petiole of cell m_1 shorter than discal cell (Fig. 34).



Figures 31–37. *Tipula (Emodotipula) alexanderi* Men, **sp. nov.** 31. Head, dorsal view. 32. Thorax, dorsal view. 33. Thorax, lateral view. 34. Wing. 35. Abdomen (male), lateral view. 36. Hypopygium, lateral view. 37. Abdomen (female), lateral view. Scale bars = 1.0mm.



Figures 38–47. *Tipula* (*Emodotipula*) *alexanderi* Men, **sp. nov.** 38. Hypopygium, dorsal view. 39. Hypopygium, ventral view. 40. Hypopygium, lateral view. 41. Inner gonostylus, inner lateral view. 42. Inner gonostylus, outer lateral view. 43. Outer gonostylus, lateral view. 44. Semen pump, lateral view. 45. Compressor apodeme, dorsal view. 46. Ovipositor, lateral view. 47. Ovipositor, dorsal view. Scale bars: 38–40, 46–47 = 1.0 mm; 41–45 = 0.25 mm.

Abdomen. Abdominal tergites brown, narrowly variegated by black stripes on lateral margins, first tergite covered with a dark brown spot near posterior margin, second tergite with a dark brown spot, which connected to each other, forming a spindle-shaped mark, tergites seven and eight wholly dark brown (Fig. 35). Sternites uniformly brown. Hypopygium dark brown (Fig. 36). Tergite nine with a U-shaped notch medially, numerous nail-like points arising from the margin of notch, a pair of prominences generated from posterior margin, which densely equipped with small black setae (Fig. 38). Sternite nine produced into finger-like processes in lateral angles, which rounded apically and densely covered with long hairs, with a median prominence which truncated at apex and densely covered with short straight hairs, the short hairs arranged in trapezoid on the median area of sternite nine (Figs 39–40). Inner gonostylus terminated into angular end, curved apically, base area protruding with a lobe on inner side (Figs 41–42). Outer gonostylus slightly curved, densely covered with black teeth and extending to the median area of inner gonostylus, with some longer and slenderer setae on lateral side (Fig. 43).

Semen pump with compressor apodeme fan-shaped, each lateral angle rounded (Fig. 45). Posterior immovable apodeme curved dorsally, very acute apically, slightly longer than compressor apodeme (Fig. 44). Anterior immovable apodeme with arms very short, acute apically (Fig. 44). Aedeagus slender, at least 4.0 times longer than semen pump (Fig. 44).

Female body length 13.0 mm, wing 20.4 mm, antenna 3.0 mm.

Colors of head and thorax similar to those of male.

Abdomen yellowish-brown, tergites with median and lateral stripes, tergite six almost wholly variegated with black, tergites seven to ten wholly black (Fig. 37). Sternite yellowish-brown with lateral stripes black (Fig. 37). Ovipositor black (Figs 46–47). Cerci short, gradually narrowed to apex (Figs 46–47). Hypoalva very small, triangular, rounded apically (Figs 46–47).

Material examined. Holotype. ♂. China, Anhui, Yaoluoping National Nature Reserve, Yaoluoping Village (30°59'N, 116°04'E), 26 Aug. 2016, coll. Qiulei Men. Paratype. 1♀, same data as holotype.

Etymology. The specific epithet is a noun after the name of Charles P. Alexander, the famous crane flies researcher, for commemorating his excellent work.

Remarks. The new species is mostly similar to the species *Tipula (Emdotipula) lishanensis* Young, 2014 from Taiwan, China, in the colors of body and wing, the sternite nine with two elongated lobes and the shape of inner gonostylus. It can be easily separated from the latter by posterior margin of tergite nine without a pair of finger-shaped processes medially and without sacculi laterales as illustrated in Figure 38 (with such processes and sacculi laterales in relative species as described by Young, 2014: 234), by the shape of outer gonostylus which slightly curved not boomerang-shaped (as a boomerang-shaped blade in relative species as described by Young, 2014: 234).

Distribution. China (Anhui).

***Tipula (Emdotipula) yaoluopingensis* Men, 2015** (Figs 48–53)

Tipula (Emdotipula) yaoluopingensis Men, 2015b: 797.

Material examined. 1♂ (holotype), Anhui, Yaoluoping National Nature Reserve (31°2'N, 116°5'E) 15 August 2013, coll. Qiulei Men. 2♂ (paratypes), same data as holotype. 1♂, Anhui, Yaoluoping National Nature Reserve, Yaoluoping Village (30°59'N, 116°04'E), 24 August 2016, coll. Qiulei Men.

Distribution. China (Anhui).

***Tipula (Pterelachisus) biaciculifera* Alexander, 1937**

Tipula (Oreomyza) biaciculifera Alexander, 1937: 17.

Tipula (Pterelachisus) biaciculifera Alexander: Men, 2015b: 804.

Material examined. 7♀8♂, Anhui, Yaoluoping National Nature Reserve, 16 August 2013, coll. Qiulei Men. 8♀12♂, Anhui, Yaoluoping National Nature Reserve, 17 August 2013, coll. Qiulei Men. 5♀10♂, Anhui, Yaoluoping National Nature Reserve, 25 August 2016, coll. Qiulei Men, Pingping Sheng.

Distribution. China (Anhui, Zhejiang, Jiangxi).

***Tipula (Yamatotipula) nova* Walker, 1848**

Tipula (Yamatotipula) nova Walker, 1848: 71; Savchenko, 1961: 227; Yang & Yang, 1997: 1437; Men *et al.*, 2015: 328–338.

Tipula fumifasciata Brunetti, 1911: 250. Synonymised by Alexander, 1920: 269.

Yamatotipula nohirae Matsumura, 1916: 460. Synonymised by Alexander, 1920: 269.

Material examined. 3♂2♀, Anhui, Yaoluoping National Nature Reserve, Yaoluoping Village (30°59'N, 116°04'E), 24

August 2016, coll. Qiulei Men.

Distribution. China (Shanxi, Henan, Anhui, Hubei, Jiangxi, Zhejiang, Fujian, Sichuan, Yunnan, Guizhou, Guangdong, Taiwan, Hong Kong), India, Japan, Korea.



Figures 48–53. *Tipula (Emodotipula) yaoluopingensis*. 48. Head, dorsal view. 49. Thorax, dorsal view. 50. Thorax, lateral view. 51. Abdomen (male), lateral view. 52. Wing. 53. Hypopygium, lateral view. Scale bars = 1.0 mm.

***Tipula (Vestiplex) coxitalis* Alexander, 1935**

Tipula (Oreomyza) coxitalis Alexander, 1935a: 523.

Tipula (Vestiplex) coxitalis Alexander: Men, 2015b: 801.

Material examined. 1♂, Anhui, Yaoluoping National Nature Reserve, Yaoluoping Village (30°59'N, 116°04'E), 24 August 2016, coll. Qiulei Men.

Distribution. China (Anhui, Taiwan).

***Tipula (Vestiplex) jiangi* Yang & Yang, 1991 (Figs 54–66)**

Tipula (Vestiplex) jiangi Yang & Yang, 1991: 253.

Diagnosis. The species is general yellowish-brown in coloration. Head is yellowish-brown with a brown occipital stripe. Prescutum is grayish-brown, heavily pruinose, with four brown stripes. Wings are grayish-brown with cells *c* and *sc* darker than ground color. Abdominal tergites one to four are yellowish-brown with darker stripes medially and laterally, tergites five to eight are wholly dark brown. Tergite nine is separated medially into two parts, with a pair of angular arms ventrally. Gonocoxite is elongate, widened basally and gradually narrowed to apex forming a horn directed dorsally.

Description. Male body length 16.0 mm, wing 18.4 mm, antenna 3.5 mm.

Head. Rostrum yellowish-brown with nasus slightly darker. Antennae with scape elongated, yellowish, slightly expanded apically; pedicel very short, pot-shaped, yellowish; flagellum with basal two segments yellow, the rest segments yellowish-gray, with slightly enlarged base dark brown, each flagellomere with black verticils distinctly longer than the flagellomeres from which they arise. Palpi brown. Head yellowish-brown, occipital stripe brown, gradually narrowed to apex, the point extending to the base of vertical tubercle (Fig. 54).

Thorax. Pronotum grayish-brown, with a narrowed yellow area on anterior margin. Prescutum grayish-brown, heavily pruinose, with four brown stripes, all stripes with darker margins (Fig. 55). The median stripe broadened apically and gradually narrowed to base, the lateral stripes long-oval (Fig. 55). Scutum grayish-brown, heavily pruinose, lobes with a dark brown spots (Fig. 55). Scutellum grayish-brown, pruinose, median area paler (Fig. 55). Postnotum grayish-brown,

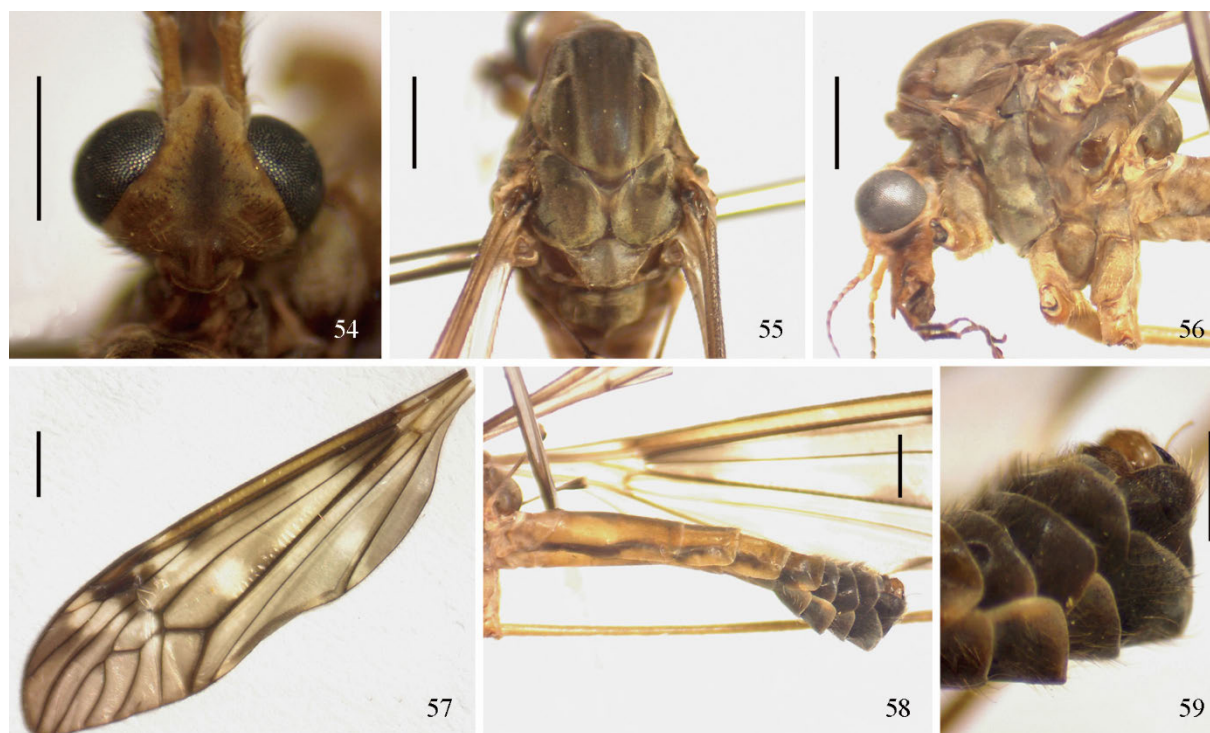
heavily pruinose (Fig. 55). Pleura grayish-brown, anepisternum, katepisternum and meron distinctly pruinose (Fig. 56). Halteres with stem yellowish-brown, knob dark brown. Legs with coxae and trochanters yellow; femora yellowish-brown with dark brown apex; tibiae and tarsi dark brown. Wing with ground color grayish-brown, cells c and sc darker than ground color, stigma dark brown, Rs tinged with dark brown at both ends, apex of wing tinged with light brown including bases of cells r_{1+2} , r_3 , r_{4+5} , m, cu, the bases of cells m and cu tinged with light brown (Fig. 57). Rs relatively long, slightly shorter than R_3 , R_{1+2} entire, discal cell relatively broad, petiole of cell m_1 distinctly shorter than discal cell (Fig. 57).

Abdomen. Abdominal tergites one to four yellowish-brown with median and lateral stripes, tergites five to eight wholly dark brown (Fig. 58). Sternites one to four yellowish-brown without stripes, sternites five to eight wholly dark brown. Hypopygium dark brown (Figs 58–59). Gonocoxite elongate, separated from sternite nine, widened basally and gradually narrowed to apex forming a horn directed dorsally (Figs 60–62). Tergite nine separated medially, a pair of angular arms arising from ventral surface of tergite nine (Fig. 61). Sternite nine with a median prominence, on each side of which with a pair of finger-like processes (Fig. 62). Outer gonostylus simple, long lobes (Figs 60–62). Inner gonostylus with two beaks and a transverse ridge medially, dorsal angle rounded in outer lateral view, with a transparent angular lobe on inner side in dorsal view (Figs 60–64).

Semen pump with compressor apodeme V-shaped, each arm expanded apically (Fig. 66). Posterior immovable apodeme straight, narrowed to apex, subequal in length to compressor apodeme (Fig. 65). Anterior immovable apodeme with arms broad (Fig. 65). Aedeagus slender, at least 2.5 times longer than semen pump (Fig. 65).

Material examined. 1♂, Anhui, Yaoluoping National Nature Reserve, Yaoluoping Village (30°59'N, 116°04'E), 15 August 2013, coll. Qiulei Men.

Distribution. China (Anhui, Hubei, Sichuan)

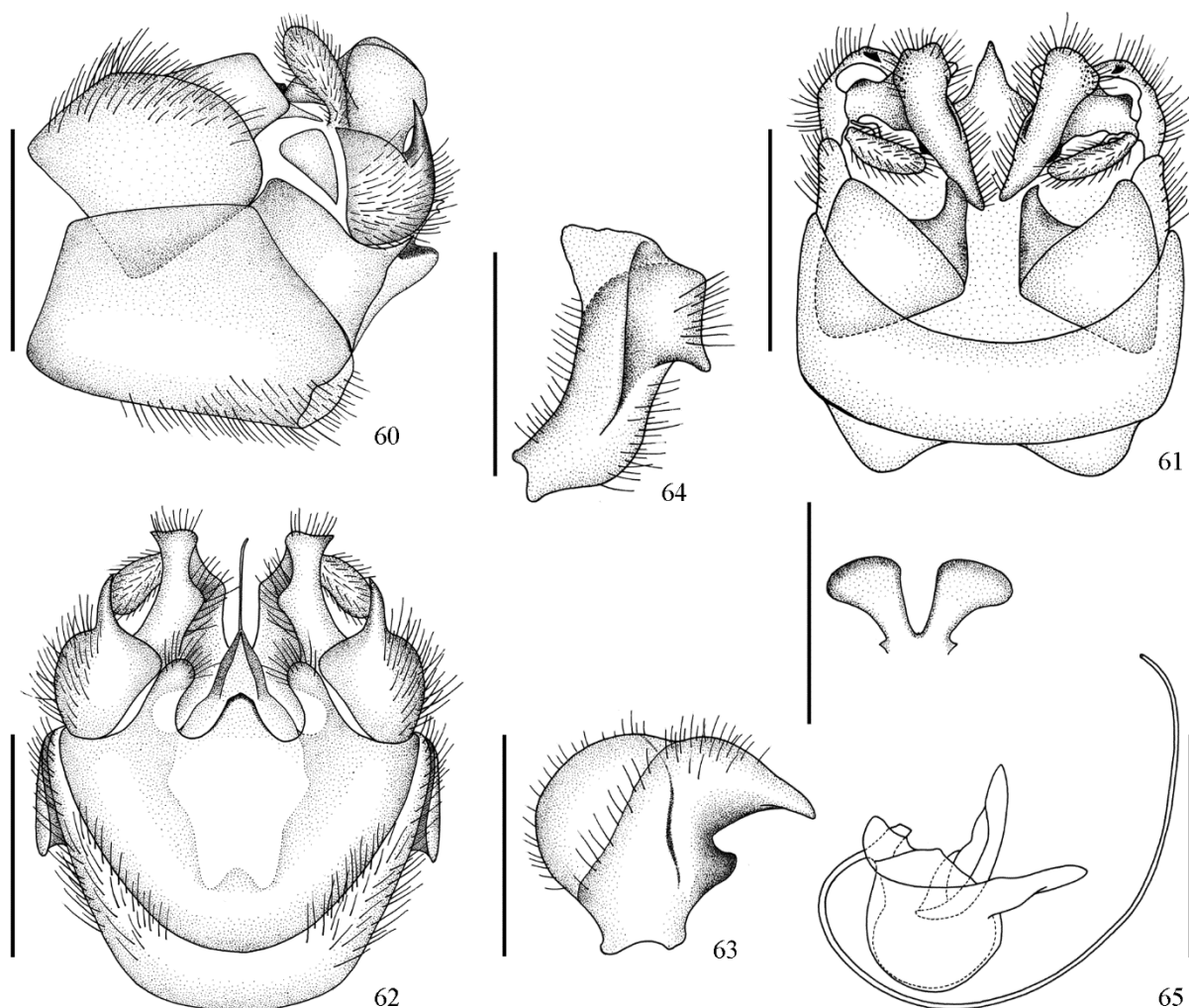


Figures 54–60. *Tipula (Vestiplex) jiangi*. 54. Head, dorsal view. 55. Thorax, dorsal view. 56. Thorax, lateral view. 57. Wing. 58. Abdomen, lateral view. 59, 60. Hypopygium, lateral view. Scale bars: 54–58=1.0mm; 59–60=0.5mm.

Key to crane flies in Yaoluoping National Natural Reserve.

1. Terminal segment of palpus elongate, distinctly longer than rest segments; nasus usually distinct; Sc_1 usually atrophied or incomplete (Tipulidae).....2
2. Terminal segment of palpus short, subequal to rest segments in length; nasus absent; Sc_1 complete (Limoniidae).....3
2. Second to ninth flagellomere with two branches.....*Dictenidia yuexiensis*
- Flagellomere without branch.....4
3. Inner gonostylus with processes or lobes5
- Inner gonostylus without any prominence*Hexatoma (Eriocera) cleopatroides*

4. Terminal of femora with comb-like bristle 6
 Terminal of femora without comb-like bristle 7
5. Femora with a pale brown subterminal ring; inner gonostylus subtriangular *Libnotes (Libnotes) pseudonohirai*
 Femora without such subterminal ring; inner gonostylus oval *Libnotes (Libnotes) wanensis*
6. Pleura with a narrow stripe *Holorusia herculeana*
 Pleura without stripe *Holorusia henana*
7. Rs very short, Sc ending nearly opposite origin of Rs *Nephrotoma impigra anqingensis* Men, subsp. nov.
 Rs elongate, Sc meeting R beyond origin of Rs 8
8. Male hypopygium with tergite nine produced into a simple finger-like prominence apically *Tipula (Yamatotipula) nova*
 Tergite nine of male hypopygium without such prominence apically 9
9. Ovipositor with hypovalva short, triangular 10
 Ovipositor with hypovalva elongated, acinacifoliate 11
10. Tergite nine with narrow notch medially, apically divided into two finger-like projections ... *Tipula (Emodotipula) yaoluopingensis*
 Tergite nine without such notch and finger-like projections *Tipula (Emodotipula) alexanderi* Men, sp. nov.
11. Tergite nine produced into narrowed, sword-shaped projection in lateral angle *Tipula (Pterelachisus) biaciculifera*
 Tergite nine not as above 12
12. Gonocoxite elongate, paliform apically *Tipula (Vestiplex) coxitalis*
 Gonocoxite short, acute apically *Tipula (Vestiplex) jiangi*



Figures 61–66. *Tipula (Vestiplex) jiangi*. 61. Hypopygium, dorsal view. 62. Hypopygium, ventral view. 63. Inner gonostylus, lateral view. 64. Inner gonostylus, dorsal view. 65. Semen pump, lateral view. 66. Compressor apodeme, dorsal view. Scale bars: 61–62 = 0.5 mm; 63–66 = 0.25 mm.

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